

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A motor drive apparatus comprising:

a permanent magnet motor; and

a controller that:

estimates an amount of demagnetization of the permanent magnet motor based on a voltage control amount of a q axis applied under control of the permanent magnet motor using a d-q axis transformation; and

limits an output of the permanent magnet motor when the estimated amount of demagnetization is larger than a predetermined value, wherein

the controller (i) obtains a reference value that is the voltage control amount of only the q axis among the respective voltage control amount of the q axis and a d axis in a case where the permanent magnet motor is not demagnetized, according to a current and a motor revolution number of the permanent magnet motor being controlled, and (ii) estimates the amount of demagnetization based on a comparison between the reference value and an actual value under the control of the voltage control amount of only the q axis among the respective voltage control amount of the q axis and the d axis.

2. (Previously Presented) The motor drive apparatus according to claim 1, further comprising:

a converter changing an input voltage necessary for driving the permanent magnet motor, wherein the controller corrects the estimated amount of demagnetization according to a level of the input voltage.

3. (Previously Presented) The motor drive apparatus according to claim 1, wherein the controller estimates the amount of demagnetization based on which one of the reference value and the actual value under the control of the voltage control amount of the q axis is larger.

4. (Previously Presented) motor drive apparatus according to claim 3, wherein the controller holds a map that is configured based on a relationship between the voltage control amount of the q axis and a combination of current command values of the d and q axes and the motor revolution number that are preliminarily measured in a case where the permanent magnet motor is not demagnetized, and

the controller obtains the reference value from the map based on present values of the current command values of the d and q axes and a present value of the motor revolution number.

5. (Previously Presented) The motor drive apparatus according to claim 3, wherein the controller holds a map that is configured based on a relationship between the voltage control amount of the q axis and a combination of measured current values of the d and q axes and the motor revolution number that are preliminarily measured in a case where the permanent magnet motor is not demagnetized, and

the controller obtains the reference value from the map based on present values of the measured current values of the d and q axes and a present value of the motor revolution number.

6. (Previously Presented) The motor drive apparatus according to claim 1, wherein the controller estimates the amount of demagnetization based on a difference between the reference value and the actual value under the control of the voltage control amount of the q axis.

7. (Previously Presented) The motor drive apparatus according to claim 6, wherein the controller holds a map that is configured based on a relationship between the voltage control amount of the q axis and a combination of current command values of the d and q axes and the motor revolution number that are preliminarily measured in a case where the permanent magnet motor is not demagnetized, and

the controller obtains the reference value from the map based on present values of the current command values of the d and q axes and a present value of the motor revolution number.

8. (Previously Presented) The motor drive apparatus according to claim 6, wherein the controller holds a map that is configured based on a relationship between the voltage control amount of the q axis and a combination of measured current values of the d and q axes and the motor revolution number that are preliminarily measured in a case where the permanent magnet motor is not demagnetized, and

the controller obtains the reference value from the map based on present values of the measured current values of the d and q axes and a present value of the motor revolution number.

9. (Previously Presented) The motor drive apparatus according to claim 1, further comprising an inverter, wherein the voltage control amount is corrected by adjusting dead time of transistors in the inverter when voltage applied to the inverter changes.

10. (Previously Presented) The motor drive apparatus according to claim 1, further comprising an inverter, wherein the voltage control amount is corrected by adjusting dead time in measuring the voltage control amount when voltage applied to the inverter changes.